Jingqi Huang

CONTACT INFORMATION

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EDUCATION

University of California, San Diego, La Jolla, California USA

M.S., Eletronical and Computer Engineering — **September 2018 - June 2020**
Overall GPA: 3.72/4.0

Beijing University of Posts and Telecommunications, Beijing, China
Queen Mary University of London, London, UK

B.S., Internet of Things Engineering — **September 2014 - June 2018**
Overall GPA: 3.60/4.0

PUBLICATIONS

[C1] Full paper submitted to *The 26th Annual International Conference on Mobile Computing and Networking (MobiCom 20')* as co-primary author.

[C2] A. Zhou, S. Xu, S. Wang, **J. Huang**, S. Yang, T. Wei, X. Zhang and H. Ma, "Robot Navigation in Radio Beam Space: Leveraging Robotic Intelligence for Seamless mmWave Network Coverage", *in proceedings of ACM International Symposium on Mobile Ad Hoc Networking (MobiHoc'19)*

[C3] **J. Huang***, S. Wang* (co-primary) and A. Zhou, "KPad: Maximizing Channel Utilization for MU-MIMO Systems using Knapsack Padding", *in proceedings of IEEE International Conference on Communications 2018 (ICC'18)*

[J1] A. Zhou, S. Xu, S. Wang, **J. Huang**, S. Yang, X. Zhang and H. Ma, "Robotic Millimeter-Wave Wireless Networks", *Submitted to IEEE/ACM Transactions on Networking (ToN)*

PAPER IN PREPARATION

[J2] A. Zhou, Z. Zhang, **J. Huang**, S. Wang, X. Zhang and H. Ma, "Towards Robust Millimeter Wave Links under Mobility and Blockage via Efficient Model-driven Beam Steering", *To be submitted*

POSTERS

[P1] S. Wang*, **J. Huang*** (co-primary) and X. Zhang, "Approximating Omni-Directional mmWave Coverage Using an Array of Phased-Arrays", *UCSD 5G & Beyond Forum 2019*

[P2] R. Zhao, S.Wang, **J. Huang** and X. Zhang, "5G Millimeter-Wave V2X: A Reality Check", *UCSD Research Review 2018*

RESEARCH EXPERIENCE

Demystify milimeter-wave (mmWave) vehicle-to-infrastructure (V2I) (Ongoing) [P2]

- Aim to carry out the first measurement study for mmWave V2I to demystify its feasibility, potential and limitations.
- According to the unique aspects of mmWave and V2I, we design a throughout experiment plan to characterize link dynamic, impact of codebook and beam management, interference, antenna geometry and etc.
- Leverage *Simulation of Urban Mobility* (SUMO) and *Wireless Insite* to do extensive simulations with traffic models in different environment settings, including urban, suburban and highway.
- Experiment shows mmWave's capability to provide stable link at a speed over 60 mph.

Enable WiFi-like coverage in mmWave network using an Array of Phased-Arrays (APA) [C1, P1]

- Work in submission.

Leverage Robot relay to enable seamless mmWave network coverage [C2, J1]

- Aim to overcome the coverage limitation nature of mmWave network and provides seamless room-level mmWave coverage using a robotic relay.
- Design novel algorithms to recover the propagation of the signal path using measured RSS, and then reconstruct the outline of the environment.
- Design an adaptive path planning algorithm that navigates the robot relay in real-time, and statistically maximizes network performance under environment dynamics and the clients self-blockage.
- Implement our design on a programmable robot, integrated with COTS 802.11ad radios. Our experiments in multi-room environments verify that RoMil can maintain nearly full coverage for an office environment while robot moving area is constrained, and the performance of a robotic relay is equivalent to 4-5 access points to achieve similar performance.

Enable robust mmWave link using model-driven beam steering [J2]

- Aim to improve mmWave network's low robustness under mobility and blockage with a model-driven beam steering method.
- Employ a reverse-engineering approach to reconstruct spatial channel profiles (SCPs) at new locations using their correlations. Predict the optimal beams directly as the transmitter/receiver moves to new locations, without brute-force beam scanning.
- Design a blockage-resilient beam prediction mechanism into the optimization model, to maintain high performance with concurrent mobility and blockage.
- Propose a greedy approximation algorithm to reduce computational overhead involved with the reverse-engineering for user tracking, achieving real-time beam steering.
- Evaluate our design using a reconfigurable 60 GHz testbed along with a trace-driven simulator. Our experiments demonstrate multi-fold throughput gain compared with state-of-the-art under various practical scenarios.

Approximate maximum channel utilization for MU-MIMO systems using Knapsack Padding [C3]

- Aim to fully ultilize the idle channel caused by frame size diversity, in MU-MIMO systems by padding extra users' frames after shorter frames transimission completed.
- Formulate the user padding using a *multi-stream knapsack model*, a variant of the classical knapsack model. Propose a "step-by-step" greedy stream decoupling mechanisim to decouple the interstream interference.
- Design the novel *KPad* algorithm that schedules padding users optimally to fully utilize the channel.
- Evaluate KPad using trace-driven emulation with 50 user traces collected by WARP SDR. Extensive evaluation results demonstrate remarkable throughput gain (up to 42%) compared with the state-of-art.

Skills

- Languages: C, Java, C++, Python, Matlab, HTML/CSS, Shell, mySQL, Assembly, LaTeX
- Platforms: Linux, MacOS, Windows

Honors and Awards

2014-2017 Beijing University of Posts and Telecommunications scholarship